

## STUDIES IN AUSTRALIAN GRASSES 6\*. *ALEXFLOYDIA*, *CLIFFORDIOCHLOA* AND *DALLWATSONIA*, THREE NEW PANICOID GRASS GENERA FROM EASTERN AUSTRALIA

Bryan K. Simon

Queensland Herbarium, Meiers Road, Indooroopilly, Qld 4068, Australia

### Summary

Three new panicoid genera, namely *Alexfloydia* from northern New South Wales, and *Cliffordiochloa* and *Dallwatsonia* from the Cook Pastoral District of Queensland, are described as new and compared with related genera of the Paniceae. New species described are *Alexfloydia repens*, *Cliffordiochloa parvispicula* and *Dallwatsonia jelliana* and details are given of their morphology and anatomy.

### Introduction

A number of classifications of *Panicum* and allied genera have been proposed in the past (Chase 1908, 1911; Hitchcock & Chase 1910, 1915; Stapf 1917-1934; Hsu 1965; Butzin 1970; Brown 1977; Zuloaga & Soderstrom 1985; Clayton & Renvoize 1986; Zuloaga 1987) but a satisfactory scheme is far from appearing and depends on worldwide studies of generic limits of the Paniceae based on characters from many sources.

Three panicoid grass species, in which the spikelets are laterally compressed and the fertile lemma is membranous, have been a focus of my attention recently during an updating of my key to Australian grasses (Simon 1990). The lateral spikelet compression and the possession of a membranous upper lemma necessitates a more detailed examination of current views on the boundaries of the genus *Panicum*. Lateral compression and a non-indurate upper lemma are considered to be non-*Panicum* characters in the keys of Clayton and Renvoize (1986) and Watson and Dallwitz (1988), whereas Zuloaga and Soderstrom (1985) appear undecided whether the consistency of the upper lemma ('antheicum') was a character of generic importance in determining the classification of *Panicum aristellum*. I am of the opinion that these three species, on the basis of their laterally compressed spikelets and membranous upper lemmas, should be described as new genera. They key out unsatisfactorily in existing keys to genera (Watson & Dallwitz 1988; Clayton & Renvoize 1986; Simon 1990) so designation of distinct generic rank for them seems a rational decision. This follows on from the recent tradition of checking the credentials of suspected new grass genera using the computer identification programs ONLINE (Pankhurst & Aitchison 1975) and later INTKEY (Watson & Dallwitz 1988) on Watson's automated generic descriptions of the grass genera of the world. Examples are the genera *Cyperochloa* Lazarides & L. Watson (Lazarides & Watson 1987) and *Clausospicula* Lazarides (Lazarides, Lenz & Watson 1991). The current (1991) version of INTKEY also maintains the integrity of a number of grass genera erected since the published 1988 version, including the genera *Alvimia* Calderon ex Soderstrom & Londono, *Arundoclaytonia* Davidse & Ellis, *Euthryptochloa* Cope and *Planichloa* B. Simon. Another example of the use to which Watson's automated generic descriptions of grass genera has been put is the correct taxonomic placing of a fossil grass (Thomasson, Nelson & Zakrzewski 1986). Comments from Dr. Les Watson regarding the status of the three new panicoid genera in this paper lend further weight to the selection of generic rank for these taxa. "I've had a preliminary attempt at making diagnostic descriptions and comparisons with seeming relatives etc., via INTKEY, and my impression is that they are all defensible as genera. The problem, of course, is *Panicum*, which somewhere manifests every state of every pertinent character." The automated descriptions of Watson include complete descriptions of leaf blade anatomy under headings **Abaxial leaf blade epidermis** and **Transverse section of leaf blade, physiology, culm anatomy**. The three new genera were all subjected to the standardised anatomical sectioning at Les Watson's laboratory by his technical assistant Jill Hartley and are reported in this paper in the

\*continued from Austrobaileya 3(4): 585-607 (1992)

standard format of Watson and Dallwitz (1988). Although abaxial leaf blade epidermal strips were prepared successfully and photographed for samples of all three of the new genera, a transverse section of the mid-lamina good enough for photographic reproduction was obtained only for *Alexfloydia repens*.

### *Alexfloydia* B. Simon

This grass, known locally as Floyd's Grass, was brought to the attention of naturalists in the Coffs Harbour area of New South Wales in the late 1980s. A specimen of it had been taken by Mr Alex Floyd of the New South Wales National Parks and Wildlife Service, Coffs Harbour, to Dr Surrey Jacobs of the New South Wales National Herbarium, Sydney, in late 1987. At the time Dr Jacobs was of the opinion that the specimen belonged to an unknown genus. In 1988, logging on land east of the Pacific Highway east of Bonville, where this grass was known to occur, was stopped. This was the result of an awareness campaign by local conservationists to protect this rare grass and endangered avifauna. It is only known from three localities, two east of Bonville and one south of Boambee (A. Floyd pers. comm.). The vegetation in the two habitats from which collections have been made differs to some degree, as seen from the collector's notes below.

Material was sent to me in 1988 and I identified it as *Panicum* sp. *Floyd* 3429 in the Queensland Herbarium and in my key to Australian grasses (Simon 1990). I have since been informed by Mr Floyd that this number is not one of his collecting numbers, but as the specimen has already been cited as such it will be referred to as *Floyd* [3429]. Using INTKEY this grass keys to *Arthropogon* Nees, but it differs from that genus by its glumes not being awned. It keys to *Anthenantia* P. Beauv. in the key to genera of the Paniceae in Clayton and Renvoize (1986), but that genus has hairy spikelets rather than glabrous ones as in this taxon. It keys to couplet 209 in Simon (1990) and no further as the lower glume is two-thirds as long as the spikelet, whereas the couplet provides the choices of the lower glume being either as long as the spikelet or up to half the spikelet length or absent. In Webster (1987) it keys to couplet 25, leading to the genera *Rhynchelytrum* Nees and *Melinis* P. Beauv. – now both placed in *Melinis* (Zizka 1988) – but differs by the upper glume being 9-nerved as opposed to 5–7-nerved in the latter genera.

***Alexfloydia* B. Simon, gen. nov.**, *Panico* L. affine, sed lemmate membranaceo et spicula complanato laterali, *Arthropogo* Nees affine, sed sine glumis aristis, *Anthenantio* P. Beauv. affine, sed spicula glabro differt. **Typus:** *A. repens* B. Simon.

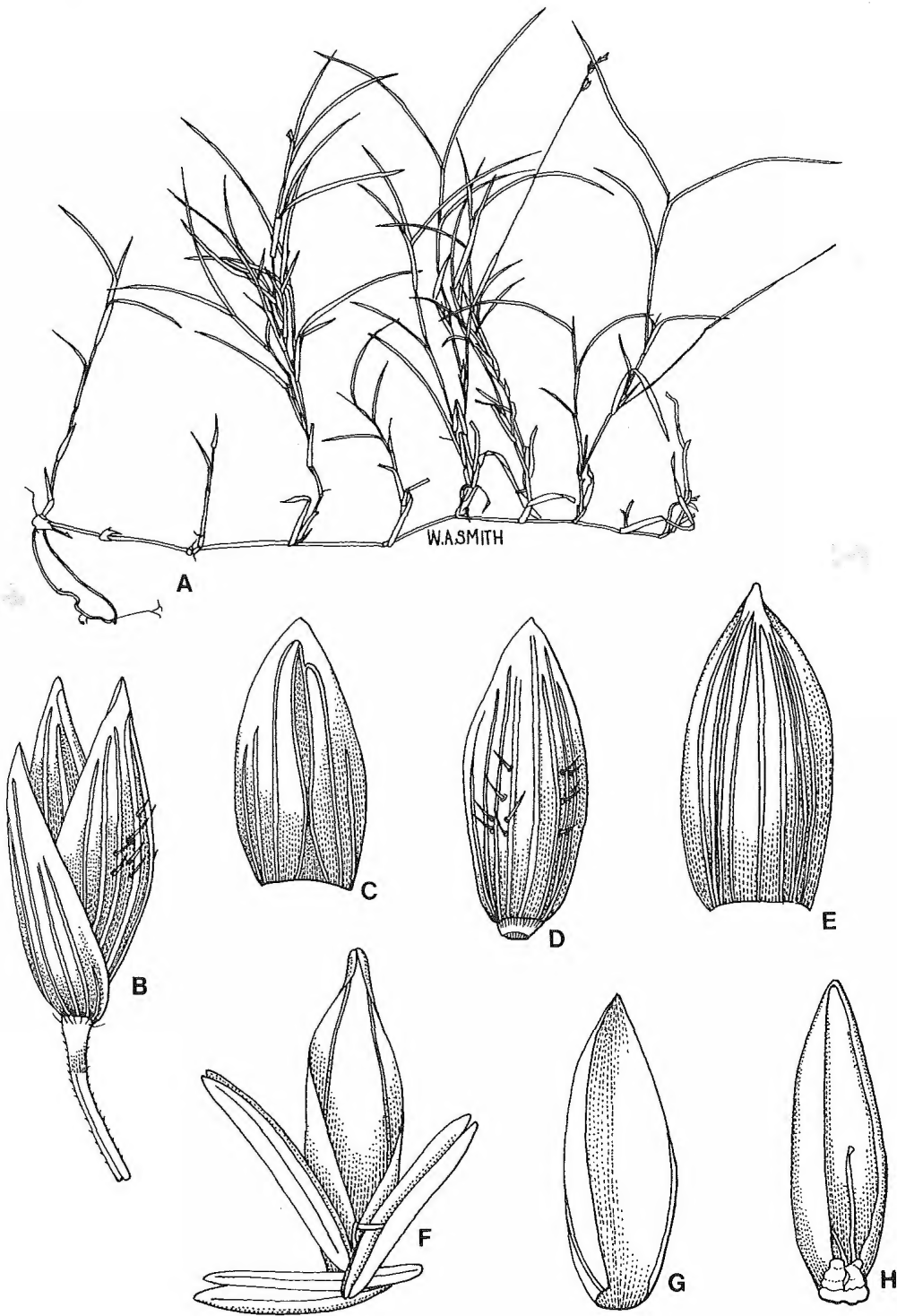
Plants stoloniferous, sparingly branched, terminated by a solitary inflorescence, 3–4-noded. Internodes shorter than the associated leaf sheaths. Sheaths compressed. Ligule a fringe of hairs. Leaf blades flat, linear, glabrous, smooth, with smooth margins and a prominent white midrib. Inflorescence a panicle of 3–6 spikelets and a short main axis, smooth. Pedicels not distinctly angled, smooth, straight. Disarticulation at the base of the spikelet. Callus not differentiated and not prolonged into a stipe. Spikelets adaxial (with the lower glume facing the pedicel), laterally compressed, elliptic in outline. Glumes unequal, chartaceous, smooth: lower glume ovate, 5–7-nerved, glabrous, acute; upper glume long, elliptic, 9-nerved, rounded on the back. Rachilla not pronounced between the glumes. Lower floret male, anthers 3; lemma elliptic, 9-nerved, chartaceous, glabrous, acute; palea elliptic, 2-nerved. Upper floret perfect: lemma oblong, obscurely 5-nerved, glabrous, yellow, firmly membranous or thinly cartilaginous, striate, acute; palea oblong, with texture similar to the lemma, entire, smooth. Lodicules 2, free, membranous. Anthers 3.

One species, northern New South Wales.

**Etymology:** The genus is named for Mr Alex Floyd, who has collected all the known material of this grass and has drawn attention to its rarity.

***Alexfloydia repens* B. Simon, sp. nov.**

Gramen stolonibus, culmis 18–24 cm altis, 3–4 nodis. Laminae foliorum laeve, 0.5–6 cm × 1–1.5 mm, marginibus laevibus, costis albis. Panicula spiculis 3–6 gerens; axis c.



**Fig.1.** *Alexfloydia repens*: A. habit  $\times 0.5$ . B. spikelet, lateral view. C. lower glume. D. upper glume. E. lower lemma, dorsal view. F. lower palea with stamens, ventral view. G. upper lemma. H. upper palea, showing lodicules at base and stamen filaments. (B-H, all  $\times 12$ ). From type specimen.

1.5 cm longus et laevis. Pedicelli 4–7 mm longi. Disarticulatus ad basem spiculae. Spiculae adaxiales, lateraliter complanatae, ellipticae in ambitu, 3–3.5 × 1.5 mm. Glumae inaequales, chartaceae, laeves: gluma infera c. 2 mm longa, ovata, 5–7-nervata, acuta: gluma supra elliptica, c. 3 mm longa, 9-nervata, rotundata in dorso, pilis tuberculatis sparsis ad medium. Flosculus inferus masculus: lemma ellipticum, 9-nervatum, chartaceum, glabrum, acutum; palea elliptica, 2-nervata, acuta. Flosculus superus perfectus, flosculus inferum longior: lemma c. 1.5 mm longa, luteum membranaceum, laeve, oblongum, acutum; palea membranacea, laevis. **Typus:** New South Wales, NORTH COAST DIVISION, Boambee, Cordwells Creek, Dutton's Estate, Portion 40, 30°20'45"S, 153°04'40"E, 7 April 1991, A.G. Floyd 2165, ground cover with some *Ottocloa gracillima*, *Gahnia clarkei* and *Fimbristylis ferruginea* in the king tide zone above *Aegiceras corniculatum* and *Avicennia marina* mangrove forest, weak soft trailing mat grass up to 20 cm tall, canopy of *Callistemon salignus* with *Parsonsia straminea* a common liane (holo: BRI(AQ 540193); iso: BRI,CANB,DNA,K,L,MEL,MO,NSW). **Fig. 1.**

Culms 18–24 cm tall. Ligule c. 0.2 mm long. Leaf blades 0.5–6 cm × 1–2 mm. Inflorescence main axis c. 1.5 cm long. Pedicels 4–7 mm long, not distinctly angled, smooth, straight. Spikelets 3.0–3.5 × 1.5 mm. Glumes: lower glume c. 2 mm long, upper glume c. 3 mm long, sometimes with a few tubercle-based hairs at the mid-region. Lower floret: anthers 2.5 mm long; lemma c. 3 mm long; palea as long as the lemma. Upper floret perfect, shorter than the lower floret: lemma c. 1.5 mm long; palea as long as the lemma. Lodicules 2, c. 0.5 × 0.3 mm long. Anthers c. 0.8 mm long. Caryopsis not seen.

**Specimens examined:** New South Wales, NORTH COAST DIVISION: Boambee, Floyd 2165 (type – for details see above) (BRI,CANB,K,L,MEL,MO,NSW); Pine Creek, east of Bonville, 30°23'15"S, 153°04'00"E, understorey to tall *Casuarina glauca* forest in sub-saline semi-wetland, soft carpet with no other ground cover or shrub layer, Oct 1987, Floyd [3429] (BRI,CFSHB); Cordwells Creek, Dutton's Estate, Portion 40, 30°20'45"S, 153°04'40"E, in the king tide zone above *Aegiceras corniculatum* and *Avicennia marina* mangrove forest, Oct 1991, Floyd 2166 (AD,B,BRI,CBG,NSW,PERTH,PRE,US).

**Conservation status:** 2K (Briggs & Leigh 1988).

**Etymology:** The species is named for its creeping habit.

**Notes:** The spikelets of some of the specimens are insect infected, giving parts of the floret a distorted appearance.

### Anatomy

**Abaxial leaf blade epidermis:** *Costal/intercostal zonation* conspicuous. *Papillae* absent. *Long-cells* markedly different in shape costally and intercostally, the costals much narrower; of similar wall thickness costally and intercostally (thin walled). Intercostal zones with typical long-cells. Mid-intercostal long-cells rectangular, having markedly sinuous walls. *Microhairs* present, elongated, clearly two-celled, panicoid type, 50–65 microns long, 10–15 microns wide at the septum; apical cells about 40–50 microns long; apical cell/total length ratio about 0.7–0.8; total length/width ratio at septum 3–6. *Stomata* common, 30–40 microns long; subsidiaries non-papillate, parallel sided, dome shaped and triangular (low to medium, predominantly more or less triangular with the apices truncated to various extents), including both triangular and parallel-sided forms on the same leaf; guard-cells overlapping to flush with the interstomata. *Intercostal short-cells* absent or very rare. Macrohairs infrequent, intergrading with long prickles, 1–2(–3)-celled. *Crown cells* absent. Costal zones with short cells. *Costal short-cells* conspicuously in long rows. Costal silica bodies present and well developed, 'panicoid-type', consistently elongated nodular, not sharp-pointed. **Fig. 2A & B.**

**Transverse section of leaf blade, physiology, culm anatomy:** C<sub>4</sub>. Anatomical organisation conventional. XyMS-. PCR sheath outlines uneven. PCR sheath extensions absent. Mesophyll not *Isachne*-type, without 'circular cells', not traversed by colourless columns, without arm cells, without fusoids. *Leaf blade* adaxially flat. *Midrib* conspicuous (by virtue of a conspicuous abaxial keel, an arc of enlarged adaxial epidermal cells and some colourless mesophyll), with one bundle only or having complex vascularisation (depending on the interpretation of the minor bundles flanking the median), with colourless tissue adaxially (in the form of a few large cells contiguous with the bulliform epidermis). Lamina symmetrical on either side of the midrib. Bulliforms not in discrete, regular

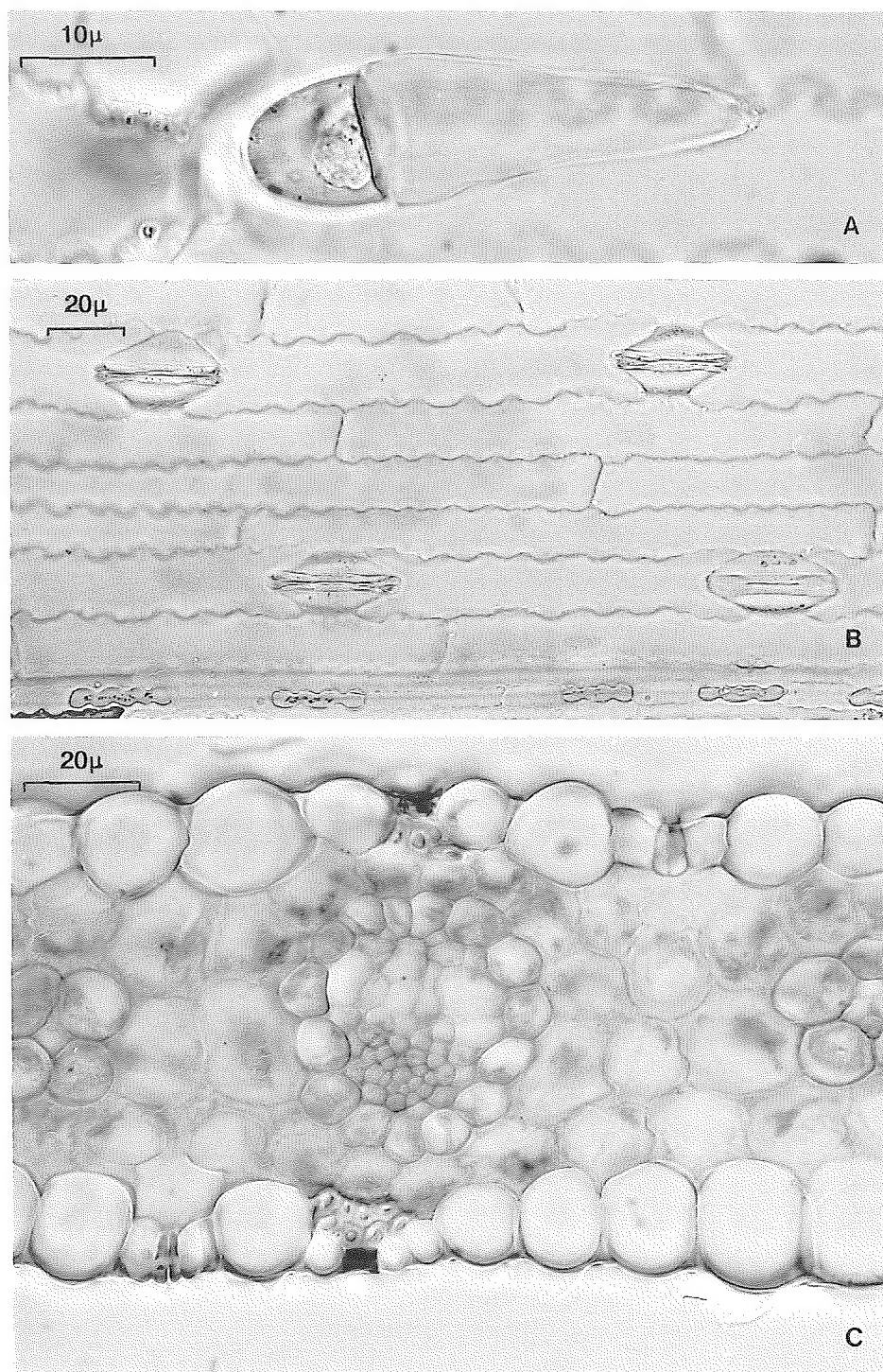


Fig. 2. *Alexfloydia repens*: A. microhair on the abaxial leaf blade epidermis. B. abaxial leaf blade epidermis. C. transverse section of part of the mid-lamina (midrib excluded). Adaxial surface uppermost.

adaxial groups (the adaxial epidermis mainly bulliform), nowhere involved in bulliform-plus-colourless cell arches. Many of the smallest vascular bundles unaccompanied by sclerenchyma. Combined sclerenchyma girders absent (the sclerenchyma restricted to a large abaxial strand in the keel and small adaxial and abaxial strands with the major laterals). Sclerenchyma all associated with vascular bundles. Fig. 2C.

### *Cliffordiochloa* B. Simon

This grass has been collected only twice from the same locality in the Johnstone Shire of the Cook District of northern Queensland. It is an aquatic grass and although mentioned by the collector to be 'spreading quickly' it has not been collected outside the type locality. Using INTKEY (Watson & Dallwitz 1988) it keys to *Sacciolepis* Nash from which it differs by its spikelets not being saccate. It keys to couplet 81 in the key to genera of the Paniceae of Clayton and Renvoize (1986), leading to the genera *Arthropogon* Nees and *Reynaudia* Kunth; it differs from the former by the lower glume not being awn-like and from the latter by the lower glume not being bilobed. It keys to *Digitaria* Haller in Simon (1990) but differs from that genus by the lateral compression of the spikelet and the lower glume being at least one third the spikelet length. It keys to couplet 25 in Webster (1987), leading to *Rhynchelytrum* Nees and *Melinis* P. Beauv. in Webster (1987) but differs from them in that the spikelets are much smaller and the upper glume has fewer nerves. In Simon (1990) it was recorded as *Whiteochloa* sp. *D. Mitchell* 11, but it differs from that genus by the rachilla between the florets not being pronounced and the upper lemma being hyaline and not indurate. It is also superficially close to *Cyrtococcum* Stapf but that genus has a crested apex on the upper lemma. It differs from *Dallwatsonia* B. Simon by the upper lemma tightly enclosing the upper palea, the 1-nerved lower glume and much smaller spikelets which are distinctly paired. Finally it differs from all the above-named panicoid genera with which it has been compared, by the upper floret having only two stamens, an unusual situation in the Paniceae and only known in one other genus, *Reynaudia* Kunth from Cuba (Watson & Dallwitz 1988).

***Cliffordiochloa* B. Simon, gen. nov.**, *Whiteochloae* C.E. Hubb. affine sed sine rhachilla conspicua inter flosculos et lemmata supera hyalina, *Sacciolepi* Nash affine sed sine spicula saccata, *Digitariae* Haller affine sed gluma infera longiore, *Cyrtococco* Stapf affine sed sine apice lemmatis cristato, *Dallwatsoniae* B. Simon affine sed lemmate supero arcte paleam superam includenti arcte, eorum omnibus staminibus duobus differt. **Typus:** *C. parvispicula* B. Simon.

Weak perennial. Culms erect, tufted, sparingly branched towards apex, terminated by a solitary inflorescence, 4–6-noded. Internodes longer than the associated leaf sheaths, which are compressed. Ligule a membrane. Leaf blades flat, linear, glabrous, with smooth margins. Inflorescence a panicle with main axis, long and scabrous. Primary branches spreading, not whorled, and scabrous on the margins. Pedicels distinctly angled, scabrous, straight, with glabrous apices. Disarticulation at the base of the spikelet. Callus not differentiated. Spikelets adaxial, to 50 on a typical lowermost primary branch, laterally compressed, elliptic. Glumes unequal, membranous, glabrous: lower glume not fused with the callus, deltoid, 1 nerved, smooth, scabrous on keel; upper glume elliptic, pinched at apex, 3- sub 5-nerved, rounded on the back. Rachilla not pronounced between the glumes. Lower floret sterile; lemma elliptic, membranous, glabrous, acute and pinched at apex; palea narrowly elliptic, as long as the lemma, acute. Upper floret perfect, shorter than the lower floret, not stipitiform; lemma white, hyaline, smooth, elliptic, rounded on the back, glabrous, apically rounded; palea hyaline, smooth. Anthers 2, brownish mauve.

One species, Cook Pastoral District, Queensland.

**Etymology:** The genus is named for Professor H.T. (Trevor) Clifford (University of Queensland) who has done much work on classification of grass genera and who collected much of the early data on Australian genera used by Watson and Dallwitz in their computer generated keys to Australian and later world grass genera.

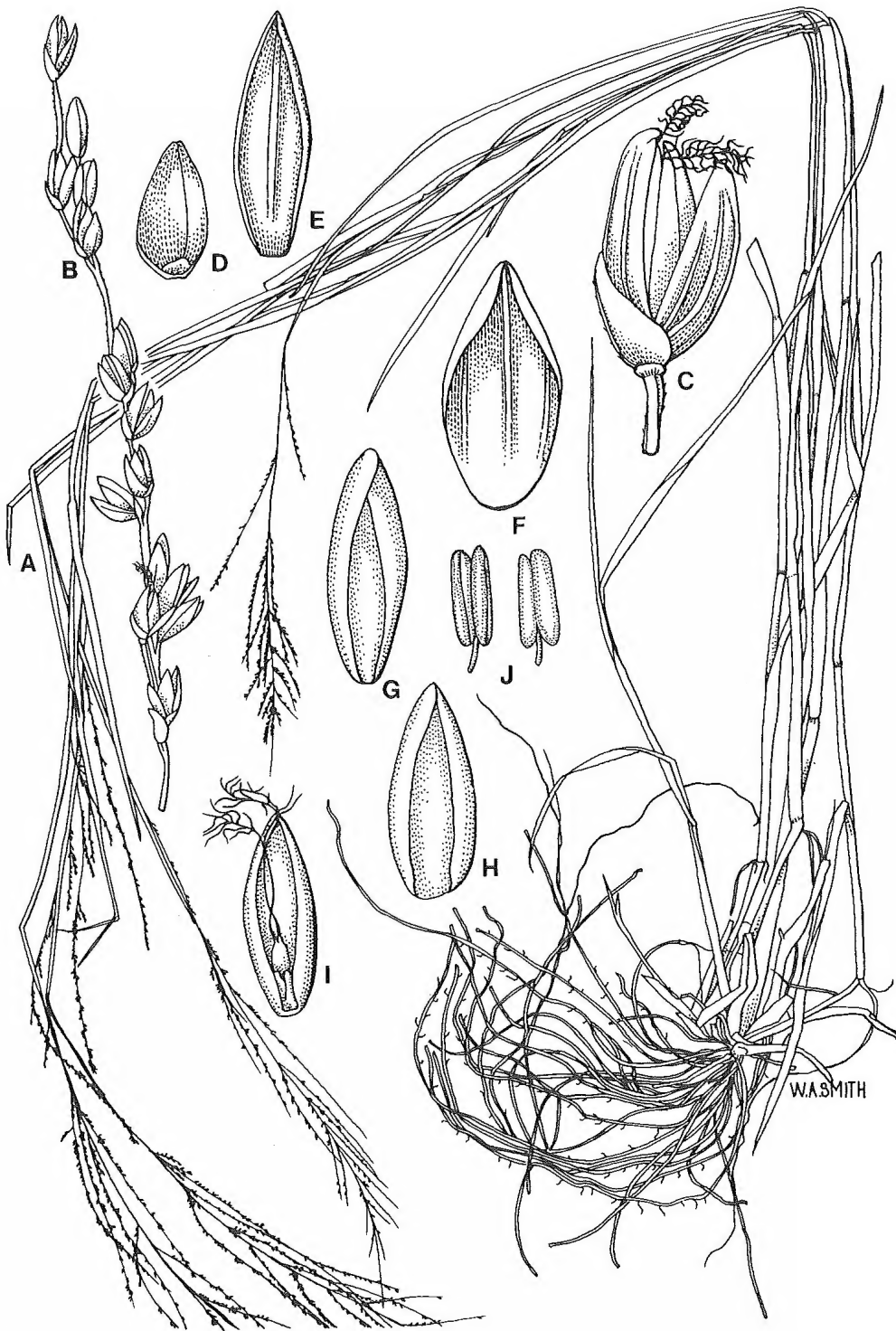


Fig. 3. *Cliffordiochloa parvispicula*: A. habit  $\times 0.5$ . B. portion of panicle  $\times 6$ . C. spikelet, lateral view. D. lower glume. E. upper glume. F. lower lemma. G. lower palea. H. upper lemma. I. upper palea with young ovary and stigmas. J. anthers. (C–J, all  $\times 25$ ). From type specimen.

**Cliffordiochloa parvispicula** B. Simon, sp. nov.

Gramen perenne infirmum. Culmi erecti, caespitosus, 60–80 cm alti, 4–6-nodi. Laminae foliorum planae, 5–15 cm × 2–3 mm, lineares, glabrae, marginibus laevibus. Axis paniculae 10–20 cm longus, scaber. Rami 4–10 cm longi. Disarticulatus ad basem spiculae. Spiculae adaxiales, lateraliter complanatae, ellipticae in ambitu, c. 1.5 × 0.5 mm. Glumae inaequales, membranaceae, glabrae: gluma infera c. 0.5 mm longa, deltata, 1-nervata, laevis, scabra in nervo: gluma supera c. 1.5 mm longa, elliptica, 3-sub 5-nervata, rotundata in dorso. Flosculus inferus sterilis: lemma ellipticum, membranaceum, glabrum, acutum; palea anduste elliptica, acuta. Flosculus superus perfectus, flosculum inferum brevior, non stipitiformis: lemma c. 1.2 mm longum, album, hyalinum, ellipticum, laeve, glabrum, rotundatum ad apicem; palea hyalina, laevis. **Typus:** Queensland. COOK DISTRICT: Mena Creek Valley, Johnstone Shire, on property of E.W. and A. Holder, Mena View, Mena Creek, 17°4′S, 145°5′E, confined to water channels, thick mat, spreading quickly, 26 January 1983, *D.J. Mitchell* 11 (holo: BRI(AQ 349007); iso: CANB). **Fig. 3.**

Culms 60–80 cm tall. Ligule c. 0.5 mm long. Leaf blades 5–15 cm × 2–3 mm. Inflorescence with main axis 10–20 cm long. Primary branches 4–10 cm long. Pedicels 0.5–1.5 mm long. Spikelets c. 1.5 × 0.5 mm. Glumes: lower glume c. 0.5 mm long; upper glume c. 1.5 mm long. Lower floret: lemma c. 1.5 mm long; palea as long as the lemma. Upper floret shorter than the lower floret; lemma c. 1.2 mm long, palea hyaline, smooth. Anthers c. 0.5 mm long. Caryopsis not seen.

**Specimens examined:** Queensland. COOK DISTRICT: Mena Creek, Johnstone Shire on E. Holder's Property, 17°4′S, 145°5′E, undulating foothill country, Mar 1983, *Mitchell* s.n. (BRI,CANB); *D.J. Mitchell* 11 (type – for details see above) (BRI,CANB).

**Conservation status:** 2K with a possibility of it being 2V as it has only been collected from the type locality (Briggs & Leigh 1988).

**Etymology:** The species is named for its small spikelets.

**Anatomy**

**Abaxial leaf blade epidermis:** *Costal/intercostal zonation* conspicuous. *Papillae* absent. *Long-cells* markedly different in shape costally and intercostally, the costals much narrower; of similar wall thickness costally and intercostally (the walls of medium thickness). Intercostal zones with typical long-cells. Mid-intercostal long-cells rectangular, having markedly sinuous walls. *Microhairs* present, elongated, clearly two-celled, panicoid-type, 30–45 microns long, 5–10 microns wide at the septum; apical cells 20–30 microns long. Microhair apical cell/total length ratio 0.4–0.6; total length/width ratio at septum 4–6. *Stomata* common, 20–30 microns long; subsidiaries non-papillate, low dome-shaped to triangular or parallel-sided by extreme truncation of triangles, including both triangular and parallel-sided forms on the same leaf; guard-cells overlapping to flush with the interstomata. *Intercostal short-cells* common, in cork/silica-cell pairs or many solitary, sometimes silicified. Intercostal silica bodies mostly cross shaped. *Crown cells* absent. Costal short-cells conspicuously in long rows. Costal silica bodies present and well developed, 'panicoid-type', nearly all dumb-bell shaped, not sharp pointed. **Fig. 4A.**

**Transverse section of leaf blade, physiology, culm anatomy:** C<sub>3</sub>. XyMS+. Mesophyll with radiate chlorenchyma, *Isachne*-type, without 'circular cells', not traversed by colourless columns, without arm cells, without fusoids. *Midrib* conspicuous, with one bundle only or having complex vascularisation (depending on the interpretation of the midrib), without colourless tissue adaxially. *Lamina* symmetrical on either side of the midrib. Bulliforms in discrete, regular, adaxial groups, in simple fans (these large), nowhere involved in bulliform-plus-colourless cell arches. All the vascular bundles accompanied by sclerenchyma. Combined sclerenchyma girders present (with all the primary bundles, the minor bundles mostly with adaxial and abaxial strands). Sclerenchyma all associated with vascular bundles.



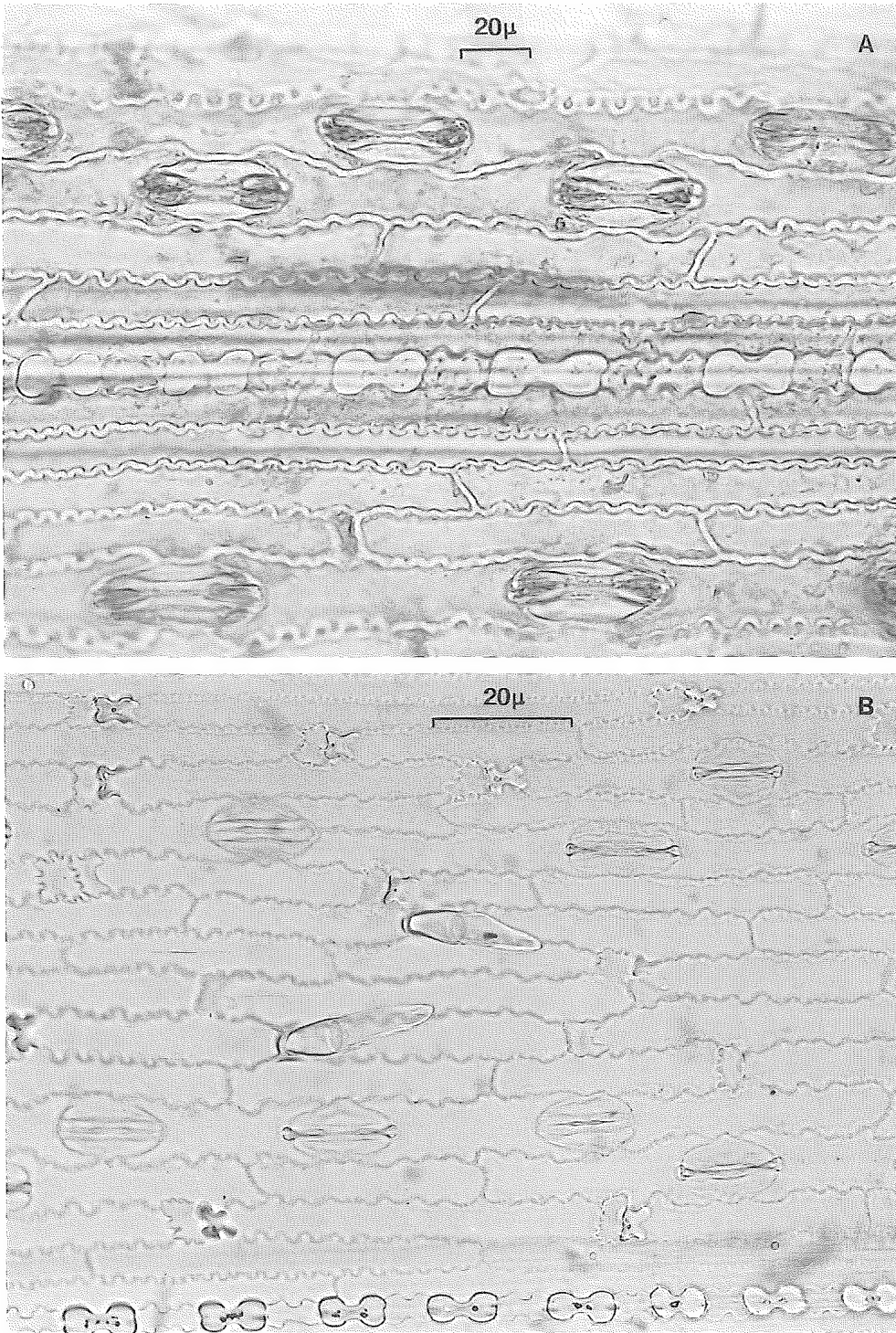


Fig. 4. A. *Cliffordiochloa parvispicula*: abaxial leaf blade epidermis. B. *Dallwatsonia felliana*: abaxial leaf blade epidermis.

*Dallwatsonia* B. Simon

This grass was submitted to the identification unit of the Queensland Herbarium in May 1991 and at the outset it looked different and interesting. Using INTKEY (Watson & Dallwitz 1988) it keys to *Sacciolepis* Nash from which it differs by its spikelets not being saccate. In the key to genera of the Paniceae in Clayton and Renvoize (1986) it keys to the second half of couplet 97, leading to *Anthenantia* P. Beauv., except that its upper lemma is membranous rather than "firm to the tip". Also it differs further from that genus by its spikelets being glabrous and by having a lower glume. It is also similar to *Whiteochloa* C.E. Hubb. but it differs from that genus by the rachilla between the florets not being pronounced and the upper lemma being hyaline and not indurate. It differs from *Cliffordiochloa* B. Simon by its upper lemma only loosely enclosing the upper palea, by its upper floret with 3 stamens, by its 5-nerved lower glume and its much larger spikelets which are not distinctly paired as in that genus.

**Dallwatsonia** B. Simon, **gen. nov.**, *Whiteochloae* C.E. Hubb. affine sed sine rhachilla inter flosculos et cum lemmatibus superis hyalinisa, *Sacciolepi* Nash affine sed sine spicula saccata, *Anthenantiae* P. Beauv. affine sed lemmate supero membranaceo, spiculato glabro, cum glumo infero, *Cliffordiochloa* B. Simon affine, sed lemmate supero paleam superam laxe includenti, gluma infera 5-nervata, staminibus tribus, spiculis multis grandioribus multis differt. **Typus:** *Dallwatsonia felliana* B. Simon.

Plants perennial. Culms erect, tall, sparingly branched, terminated by a solitary inflorescence, 7-noded. Internodes slightly longer than the associated leaf sheaths, which are keeled. Ligule a fringed membrane with the fringe extremely short, entire. Leaf blades flat, linear-lanceolate, glabrous, with smooth margins. Inflorescence a panicle, scaberulous. Primary branches spreading, not all whorled, scaberulous on the margins. Pedicels 0.1–4.0 mm long, not distinctly angled, scabrous, straight with apices glabrous. Disarticulation at the base of the spikelet. Callus not differentiated, not prolonged into a stipe. Spikelets adaxial, c. 35 on a typical lowermost primary branch, laterally compressed, lanceolate, single or indistinctly paired. Glumes unequal, membranous, glabrous: lower glume ovate, 5-nerved, smooth, rounded on the back; upper glume lanceolate, 6–7-nerved, rounded on the back, slightly pinched at apex. Rachilla slightly pronounced between the glumes. Lower floret sterile; lemma lanceolate, membranous, glabrous, acute and slightly pinched at apex; palea a narrow, linear membrane. Upper floret perfect, slightly shorter than or the same length as the lower floret, not stipitiform: lemma long, white, membranous, smooth, lanceolate, rounded on the back, glabrous, acute; palea membranous, smooth. Lodicules very small. Anthers 3.

One species, Cook District, Queensland.

**Etymology:** The genus is named for Dr Mike J. Dallwitz, Division of Entomology, CSIRO, who has pioneered the DELTA system (Dallwitz & Paine 1988), used worldwide in the taxonomic study of many biological groups, and Dr Leslie Watson, Taxonomy Laboratory, Research School of Biological Sciences, Australian National University, who, with Dallwitz, has used DELTA extensively in preparing automated descriptions and keys to grass genera of the world (Watson 1987; Watson & Dallwitz 1988) and who has encouraged many other people to use DELTA for the study of grass species. The INTKEY version of DELTA assisted greatly in the analysis of the three new genera in this paper.

**Dallwatsonia felliana** B. Simon, **sp. nov.**

Gramen perenne. Culmi erecti, ad 130 cm alti, c. 7-nodi. Laminae foliorum planae lineares-lanceolatae, 15–30 cm × 3.5–7.0 mm, glabrae, marginibus laevibus. Axis paniculae ad 22 cm longus, scaberulus, ramis 4–10 cm longis, marginibus scaberulis. Disarticulatus ad basem spiculae. Spiculae adaxiales, lateraliter complanatae, lanceolatae, 3.5–4.0 × 1.5 mm. Glumae inaequales, membranaceae, glabrae: gluma infera 1.0–1.5 mm longa, ovata, 5-nervata, laevis, rotundata in dorso; gluma supera lanceolata, c. 3.5 mm longa, 6–7-nervata, rotundata in dorso. Flosculus inferus sterilis: lemma lanceolatum, c. 3.5 mm longum, membranaceum, glabrum, acutum; palea anguste, linearis, c. 2 mm longa, membranacea. Flosculus superus perfectus flosculum inferum aequans vel brevior, non stipitiformis: lemma lanceolatum, c. 3.5 mm longum, album, membranaceum, laeve,



Fig. 5. *Dallwatsonia felliana*: A. habit  $\times 0.33$ . B. portion of panicle  $\times 3$ . C. spikelet, lateral view. D. lower glume. E. upper glume, dorsal view. F,G. lower lemma, ventral and dorsal views respectively. H. lower palea. I. upper lemma. J. upper palea. K. young ovary and stigmas. (C-L, all  $\times 12.5$ ). From type specimen.

glabrum, rotundatum in dorso, acutum; palea membranacea, laevis. **Typus:** Queensland. COOK DISTRICT: Rokeby National Park, Langi Lagoon, 25 km N of Ranger Station, 13°27'S, 142°41'E, 30 April 1991, fringe and bank of a permanent freshwater lagoon, an occasional grass to 1 m growing in 10 cm of water, *D.G. Fell 2295* (holo: BRI(AQ 540192); iso: CANB,K). **Fig. 5.**

Culms to 130 cm tall. Ligule c. 0.5 mm long. Leaf blades 15–30 cm × 3.5–7.0 mm. Inflorescence with main axis to 22 cm long. Primary branches to 6 cm long. Pedicels 0.1–4.0 mm long. Spikelets 3.5–4.0 × 1.5 mm. Glumes unequal: lower glume 1.0–1.5 mm long; upper glume c. 3.5 mm long. Lower floret: lemma 3.5 mm long; palea c. 2 mm long. Upper floret slightly shorter than or the same length as the lower floret: lemma c. 3.5 mm long. Lodicules very small. Anthers c. 1.5 mm long. Caryopsis not seen.

**Specimen examined:** Queensland. COOK DISTRICT: *Fell 2295* (type – for details see above).

**Conservation status:** 1K (Briggs & Leigh 1988).

**Etymology:** The species is named for David Fell, Queensland National Parks and Wildlife Service, Cairns, who collected the type specimen, the only material of it known so far.

### Anatomy

**Abaxial leaf blade epidermis:** *Costal/intercostal zonation* conspicuous. *Papillae* absent. *Long-cells* markedly different in shape costally and intercostally, the costals much narrower; of similar wall thickness costally and intercostally (the walls of medium thickness). Intercostal zones with typical long-cells. Mid-intercostal long-cells rectangular, having markedly sinuous walls. *Microhairs* present, elongated, clearly two celled, panicoid-type (broad, almost balanoform), 30–45 microns long, 8–10 microns wide at the septum; apical cells 25–30 microns long; apical cell/total length ratio about 0.7–1.0; total length/width ratio at septum 5.0–5.5. *Stomata* common, 25–35 microns long; subsidiaries non-papillate, dome-shaped and triangular; guard-cells overlapping to flush with the interstomata. *Intercostal short-cells* common, in cork/silica-cell pairs (mostly), or some solitary, sometimes silicified. Intercostal silica bodies mostly more or less cross shaped, with a few small intercostal prickles. *Crown cells* absent. Costal zones with short-cells. *Costal short-cells* conspicuously in long rows. Costal silica bodies present and well developed, 'panicoid-type', short to medium dumb-bell shaped or nodular (a few only), not sharp-pointed. **Fig. 4B.**

**Transverse section of leaf blade, physiology, culm anatomy:** C<sub>3</sub>. XyMS+. Mesophyll seemingly *Isachne*-type in places, without 'circular cells', not traversed by colourless columns, without arm cells, without fusoids (but most of the intercostal zones with a well defined aerenchymatous region in the middle). *Leaf blade* 'nodular' in section to adaxially flat. *Midrib* conspicuous (the keel large and abaxially prominent), having a conventional arc of bundles only (the large median accompanied on either side by several small laterals), with colourless tissue adaxially. *Lamina* symmetrical on either side of the midrib. Bulliforms in discrete, regular adaxial groups, in simple fans, nowhere involved in bulliform-plus-colourless cell arches. All the vascular bundles accompanied by sclerenchyma. Combined sclerenchyma girders present (with all or most of the lateral bundles), forming 'figures' (some of the configurations somewhat I-shaped). Sclerenchyma all associated with vascular bundles.

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